for use during the millenium. Too perfect for the present state of humanity. See no more reason for considering Europe in the matter than for considering the inhabitants of the planet Mars. No; we don't care for other nations, can't help them, and they can't help us." [1]

As a means of introducing universal time, it has been proposed by Mr. Sandford Fleming, Mr. W. F. Allen, and others, that standard times based on meridians differing by an exact number of hours from Greenwich should be used all over the world. In some cases it may be that a meridian differing by an exact number of half-hours from Greenwich would be more suitable for a country like Ireland, Switzerland, Greece, or New Zealand, through the middle of which such a meridian would pass, whilst one of the hourly meridians would lie altogether outside of it.

The scheme of hourly meridians, though valuable as a step towards uniform time, can only be considered a provisional arrangement, and though it may work well in countries like England, France, Italy, Austria, Hungary, Sweden, &c., which do not extend over more than one hour of longitude, in the case of such an extensive territory as the United States difficulties arise in the transition from one hour-section to the next which are only less annoying than those formerly experienced, because the number of transitions has been reduced from seventy-five to five, and the change of time has been made so large that there is less risk of its being overlooked. The natural inference from this is that one time-reckoning should be used throughout the whole country, and thus we are led to look forward to the adoption in the near future of a national standard time, 6 hours slow by Greenwich, for railways and telegraphs throughout North America.

We may then naturally expect that by the same process which we have witnessed in England, France, Italy, Sweden, and other countries, railway time will eventually regulate all the affairs of ordinary life. There may of course be legal difficulties arising from the change of time-reckoning, and probably in the first instance local time would be held to be the legal time unless otherwise specified.

It seems certain that when a single standard of time has been adopted by the railways throughout such a large tract of country as North America, where we have a difference of local times exceeding five hours, the transition to universal time will be but a small step.

But it is when we come to consider the influence of telegraphs on business life, an influence which is constantly exercised, and which is year by year increasing, that the necessity for a universal or world time becomes even more apparent. As far as railways are concerned, each country has its own system, which is to a certain extent complete in itself, though even in the case of railways the rapidly increasing inter-communication between different countries makes the transition in time-reckoning on crossing the frontier more and more inconvenient. Telegraphs, however, take no account of the time kept in the countries through which they pass, and the question, as far as they are concerned, resolves itself into the selection of that system of time-reckoning which will give least trouble to those who use them.

For the time which is thus proposed for eventual adoption throughout the world, various names have been suggested. But whether we call it Universal, Cosmic, Terrestrial, or what seems to me best of all, World Time, I think we may look forward to its adoption for many purposes of life in the near future.

The question, however, arises as to the starting-point for the universal or world day. Assuming that, as decided by the great majority of the delegates at Washington, it is to be based on the meridian of Greenwich, it has still to be settled whether the world day is to begin at midnight or noon of that meridian. The astronomers at Rome decided by a majority of twenty-two to eight in favour of the day commencing at Greenwich noon, that is, of making the day throughout Europe begin about mid-day. However natural it might be for a body of astronomers to propose that their own peculiar and rather inconvenient time-reckoning should be imposed on the general public, it seems safe to predict that a World Day which *commenced* in the *middle* of their busiest hours would not be accepted by business men. In fact, the idea on which this proposal was founded was that universal time would be used solely for the internal administration of railways and telegraphs, and that accurate local time must be rigidly adhered to for all other purposes. It was conceded, however, that persons who travelled frequently might with advantage use universal time during railway journeys. This attempt to separate the travelling from the stationary public seems to be one that is not likely to meet with success even temporarily, and it is clear that in the future the latter class may be expected to be completely absorbed in the former. Another argument that influenced the meeting at Rome was the supposed use of the astronomical day by sailors. Now it appears that sailors never did use the astronomical day, which begins at the noon *following* the civil midnight of that date, but the nautical day, which begins at the noon *preceding*, *i.e.* twenty-four hours before the astronomical day of the same date, ending when the latter begins. And the nautical day itself has long been given up by English and American sailors, who now use a sort of mongrel time-reckoning, employing civil time in the log-book and for ordinary purposes, whilst, in working up the observations on which the safe navigation of the ship depends, they are obliged to change civil into astronomical reckoning, altering the date where necessary, and interpreting their a.m. and p.m. by the light of nature. It says something for the common-sense of our sailors that they are able to carry out every day without mistake this operation, which is considered so troublesome by some astronomers.

In this connection I may mention that the Board of Visitors of Greenwich Observatory have almost unanimously recommended that, in accordance with the resolution of the Washington Conference, the day in the English Nautical Almanac should be arranged from the year 1891 (the earliest practicable date) to begin at Greenwich midnight (so as to agree with civil reckoning, and remove this source of confusion for sailors), and that a committee appointed by them have drawn up the details of the changes necessary to give effect to this resolution without causing inconvenience to the mercantile marine.

The advantage of making the world day coincide with the Greenwich civil day is that the change of date at the commencement of a new day falls in the hours of the night throughout Europe, Africa, and Asia, and that it does not occur in the ordinary office hours (10 a.m. to 4 p.m.) in any important country except New Zealand. In the United States and Canada the change of date would occur after four in the evening, and in Australia before ten in the morning. This arrangement would thus reduce the inconvenience to a minimum, as the part of the world in which the change of date would occur about the middle of the local day is almost entirely water, whilst on the opposite side we have the most populous continents.

The question for the future seems to be whether it will be found more troublesome to change the hours for labour, sleep, and meals once for all in any particular place, or to be continually changing them in communications from place to place, whether by railway, telegraph, or telephone. When universal or world time is used for railways and telegraphs, it seems not unlikely that the public may find it more convenient to adopt it for all purposes. A business man who daily travels by rail, and constantly receives telegrams from all parts of the world, dated in universal time, would probably find it easier to learn once for all that local noon is represented by 17h. U.T. and midnight by 5h. (as would be the case in the Eastern States of North America), and that his office hours are 15h. to 21h. U.T., than to be continually translating the universal time used for his telegrams into local time.

If this change were to come about, the terms noon and midnight would still preserve their present meaning with reference to local time, and the position of the sun in the sky, but they would cease to be inseparably associated with 12 o'clock.

[1] *Proceedings* of the Canadian Institute, Toronto, No. 143, July 1885.

SCIENTIFIC SERIALS

Annalen der Physik und Chemie, No. 2, 1886.—On the galvanic conductivity of some easily fusible metallic alloys, by C. L. Weber.—On the electric conductivity of double-salts, by E. Klein.—On the galvanic polarisation of lead, by F. Streintz and E. Aulinger.—Experiment to determine the maximum of galvanic polarisation, by A. Föppl.—On the electro-magnetic rotation of the polarisation of light in iron, by A. Kundt.—Electro-magnetic rotation of natural light, by L. Sohncke.—On determination of the capillary constants of liquids, by S. Quincke.—On the relative permeability of different diaphragms and their availability as dialytic partitions, by A. Zott.—On the influence of temperature and concentration on the fluidity of liquid mixtures,

by K. Novak.—On the dispersion-equivalent and coefficient of expansion of sulphur, by A. Schrauf.

Bulletin de l'Académie Royale de Belgique, December 1885.—Some remarks on Gen. Liagre's remarks and Baeyer's posthumous note on winter and summer tides, by M. Folie. The statements that the tides are higher in summer owing to the greater heat of the sun, and that for the same reason there is greater barometric pressure, are both shown to be groundless.—Note on the Middle Devonian rocks of Belgium: the Givet limestones, their stratigraphic relations and distribution, by E. Dupont. The pure limestones of the Givet epoch are classified as under: (1) Fossiliferous gray, with stromatopores, favosites, alveolites, &c.; (2) deep blue, rarely lilac, granular or sub-compact, occasionally schistoid; (3) blue sub-compact, with small spathose particles disseminated; (4) oolithic gray; (5) fissured gray. All these limestones are distinctly stratified.—The Cetaceans of the European waters, by P. J. Van Beneden. These Cetaceans, which are described in detail, are divided into three groups: (1) Balænidæ, or true whales, such as *B. biscayensis*, *Balænoptera sibbaldii*, &c.; (2) Ziphioidæ, or Cetodonts with teeth in the lower jaw only, such as the Cachalot (*Pyseter macrocephalus*), *Hyperoodon rostratus*, &c.; (3) Delphinidæ, or Cetodonts with two rows of teeth piercing the gums, such as *Phocæna communis*, *Globiceps melas* (the Grindewall of the Orkneys), *Orca gladiator*, *Grampus griseus*, &c.—The Camiguin volcano, by A. Renard. A full description is given of the geological constitution and other natural features of this volcanic island, one of the most remarkable in the Philippine Archipelago.—Note on the meteoric display of November 27, and on an enigmatical luminous phenomenon observed on November 28, 1885, by F. Terby. In a field of observation about one-fifth of the celestial horizon the author observed, at Brussels, 1806 meteors in 57 minutes, or a mean of 31·7 per minute, which for the whole sky would give a mean of 158·4 per minute. The moment of maximum intensity appeared to be 6.16 p.m., when the meteors passed at the rate of forty-nine per minute. At 7.50 the following evening, during a violent storm accompanied by heavy rain, the observer noticed, at about 60° above the southern horizon, a very luminous region of spherical form, with a diameter of from 5° to 8°. The phenomenon, which returned at 8.5, lay evidently behind the clouds, by which it was more or less obscured. Its altitude and position seemed to connect it with the needle of magnetic inclination, and it may have been associated with an aurora borealis partly concealed by the clouds.—On a new method of separating and effecting a quantitative analysis of cadmium and copper, by Dr. Leo Backenlandt.—On the Bacteria of bread fermentation, by Emile Laurent. It is shown that viscous bread is produced by *Bacillus panificans*, which renders the albuminoids soluble, feeding on saccharose, and at a depth of 7 or 8 mm. resisting the baking process. It abounds in ordinary bread, and, after the baking, may attack the starch when not sufficiently acid, transforming it to a substance analogous to erythrodextrine. The formation of viscous bread may be prevented by the addition of a sufficient quantity of organic acid.

Rivista Scientifico-Industriale, January 31.—Notes on the three comets recently discovered by Fabry, Barnard, and Brooks, by Prof. Tempel. The last-mentioned already passed its perihelion in November, but the two others will both be visible simultaneously and not far apart from each other during the second half of April and the first of May next. It is possible that Fabry's may even be projected on the solar disk on April 26 and 27.—Description of a new polarimeter (three illustrations), by Prof. Augusto Righi. The apparatus here described belongs to the penumbra type of polarimeters, which are now universally preferred, especially for measuring the rotation of vibrations. The inventor believes it to be as sensitive as those of Jellet or Laurent, while combining in itself the special advantages which are separately possessed by those two instruments.—New facts on etherification by double decomposition, by Dr. Giacomo Bertoni. Berthelot having stated that the analogies between the ethers and the salts are superficial and that profound differences exist between them, supporting this view by the assertion that direct metathesis at a cold temperature has not been obtained on organic compounds, the Italian chemist, on the contrary, here demonstrates that metathesis between organic bodies really takes place in the same way. Thus is demonstrated the extension of Berthelot's own law to organic compounds, and the principle being in perfect harmony with thermo-dynamics, in no way contradicts the laws of thermo-chemistry. With these brilliant researches Dr. Bertoni not only illustrates the theoretical aspect of modern chemistry, but also opens a wide field for new and useful applications.

Rendiconti del Reale Istituto Lombardo, February 4.—On the birational transformations of three geometrical forms of the second species, by Prof. G. Jung. The subject is treated under three separate heads. In the first are generalised some properties of the geometrical forms of the second species; in the second is given a new demonstration of two familiar formulas which occur in the theory of birational transformations; in the third the aforesaid properties are discussed in connection with some analogous subjects recently treated by several writers, especially with the question of undetermined analysis solved by De Jonquières (*Comptes rendus*, November 2 and 9, 1885) and the researches of Autonne on the groups of birational substitutions.—On the reciprocal linear correspondences in a linear space of any species, by F. Aschieri. It is shown that two fundamental forms of h species in a linear space $Sn - 1$ will be reciprocal if one is obtained from the other with a finite number of operations (projections and sections), and will constitute a polar system in respect of a general quadrature belonging to one of said forms.—A theorem on the functions each term of which is a function of $z(= x + iy)$, by Prof. Giulio Ascoli.—Meteorological observations made at the Brera Observatory, Milan, during the month of January.

Sitzungsberichte der physikalisch-medizinischen Societät zu Erlangen, Heft 17, 1885.—On alkaline fermentation of urea, and on "urea-ferment," &c., by W. Leube.—The diffraction-phenomena of a circular aperture and a circular shield, by E. Lommel.—On reducible curves, by M. Noether.—On some syntheses in the pyrrol series, by L. Know.—Projection of the interference of liquid waves, by E. Lommel.—Visible representation of the focus of the ultra-red rays by phosphorescence, by the same.—The discriminants of the binary form of the sixth degree, by R. Gordan.—On calomel, by R. Fleischer.—On partial arching of the tympanum with moderate increase of the air-pressure in the outer auditory passage, by W. Kiesselbach.—On an anomaly of the lower *vena cava*, by L. Gerlach.—On a new way of making glass windows in the shell of birds' eggs before or in the first stage of incubation, by L. Gerlach.

Revue d'Anthropologie, tome i. fasc. 1, Paris, 1886.—M. Topinard, editor of the *Revue*, treats at great length of the measurements made by Dr. P. Broca, of various crania derived from the so-called Baye Caverns in the valley of Petit-Morin (Marne). These caves, of which M. de Baye has thoroughly explored 120, have been excavated by the hand of man in the chalk, both as habitations and as places of burial, and from the appearances of the two hundred and odd skulls that have already been brought to light, and the general character of the finds, these deposits may be referred to the polished stone age. Dr. P. Broca's hitherto unpublished measurements of forty-four of these crania, and his explanations of the methods adopted in his determinations, together with his remarks on the evidence favouring his opinion that two mixed races were represented in the remains of the Marne caves, are accepted by M. Topinard as incontrovertible proof of an augmentation in the mean cephalic index among the successive races who advanced from the south to the north of France during the Neolithic period. The general mean of the index of the forty-four crania was found by Broca to be 78·1, while he gives 72·6 for the Cave-men of L'Homme Mort, and 79·5 for the men of the dolmen of Vauréal, near Paris, the Baye Cave skulls thus presenting a mean between these extremities. The present paper, which is a sequel to the series published by the Society from the mass of materials left by Broca in a more or less complete condition, will be followed by others of similar interest.—On the Cro-Magnon race, their migrations and descendants, by M. le Dr. Verneau. The author is of opinion that the Cro-Magnon type was not effaced in the Glacial period, and that it still survives in many parts of France and Italy, and nowhere in greater purity than among the Western Basques, while recent researches in Spain and Portugal show that a race presenting identical cranial characteristics had spread from one extremity of the peninsula to the other. M. Verneau believes that their presence may be traced from the valley of the Vézère, with its Cave-men, to the dolmen regions of North-West Africa, and even to the Canary Isles, and that the race, which was one of hunters, migrated from north to south in pursuit of the game on which its existence depended.—The Kirghis, by M. Nicolas Seeland.

The author, from his position as Medical Director for the province of Sémiretchie, where the Kirghis population numbers more than 550,000, has had exceptional opportunities for observing the social and domestic habits of the people; and his carefully-conducted craniometric and other measurements, together with his exhaustive remarks on the physical, moral, and intellectual characteristics of the people, their language and literature, religion and superstitions, and the past and probable future effects on the race of closer contact with Western civilisation, supply valuable materials towards the history of these ancient tribes, whose numbers are computed at upwards of a million and a half.—On the so-called cup-like excavations, "Pierres à Cupules," by M. de Nadaillac. The author passes in review the most remarkable of these stone-markings, which have been found in the most widely-separated parts of the globe since they first attracted notice in Switzerland in 1849. In Brittany, where such stone-markings and depressions have of late years been found in great numbers, they appear to be contemporaneous with the dolmen age. M. de Nadaillac is of opinion that the general similarity of the markings, of which he gives various clear drawings, cannot be accepted as a proof of any ethnic connection between the various peoples who designed them, and is probably only to be referred to a general similarity of intelligence among men at one and the same stage of their respective courses of development.—Contributions to the history of muscular anomalies, by M. Ledouble. In the present paper, which is a sequel to the author's articles in last year's *Revue* on the major and minor pectorals, he treats specially of the variations of length and breadth in the abdominal muscles, considering each anomaly from a comparative anatomical point of view.

SOCIETIES AND ACADEMIES

LONDON

Royal Society, January 28.—"On the Development of the Cranial Nerves of the Newt." By Alice Johnson, Demonstrator of Biology, Newnham College, Cambridge, and Lilian Sheldon, Bathurst Student, Newnham College, Cambridge. Communicated by Prof. M. Foster, Sec. R.S.

February 25.—"On Radiant Matter Spectroscopy: Note on the Earth Yα." By William Crookes, F.R.S.

Among the samarskite earths which concentrate towards the middle of the fractionations there is one (or a group) which presents in the radiant matter tube a well-marked phosphorescent spectrum differing from those I have already described.

The measurements of the bands and lines are given below:—

Scale of spectroscope	λ	$\frac{1}{\lambda^2}$	Remarks
10°325	6446	2407	Approximate centre of a red band shaded off on the least refrangible side.
10·310	6415	2430	Somewhat sharp edge of the red band.
10·185	6189	2611	Approximate centre of a very faint orange band.
10·130	6094	2693	A sharp narrow orange-red line.
10·05	5970	2806	Approximate centre of a narrow bright orange band. (Between this line and 2693 is a fainter semi-continuous orange band).
9·840	5676	3104	Approximate centre of a narrow bright green band.
9·790	5613	3174	Approximate centre of a narrow green band, not quite so bright as 3104.
9·690	5495	3312	Approximate centre of a bright green band, wider than the other three green bands.
9 610	5406	3422	Approximate centre of a narrow bright green band.

The earth giving the above spectrum, when sufficiently purified, presents all the characteristics of the earth discovered by Marignac, and provisionally called by him Yα (*Comptes rendus*, xc. p. 899). Through the kindness of M. de Marignac I have been enabled to compare a specimen of Yα of his own preparation with the earth described above. The two earths agree in their chemical characteristics, and their phosphorescent spectra are practically identical.

No name has yet been given to this earth, as the discoverer appears to be in some doubt whether it is not identical with J. Lawrence Smith's earth mosandra (*Comptes rendus*, lxxxvii. p. 145; lxxxvii. p. 831; lxxxix. p. 480). A specimen of mosandra prepared by J. Lawrence Smith, and sent me by M. de Marignac, gave a phosphorescent spectrum showing that it was compound, and that yttria was one of its constituents.

"On a Comparison between Apparent Inequalities of Short Period in Sunspot Areas and in Diurnal Declination Ranges at Toronto and at Prague." By Prof. Balfour Stewart, F.R.S., and William Lant Carpenter, B.A., B.Sc.

The authors discuss these inequalities in precisely the same manner in which they discussed those of a previous communication (*Proc.* Roy. Soc., vol. xxxvii. p. 290), and are led to the following conclusions:—

(α) When disturbances are excluded as much as possible, both the Toronto and the Prague declination inequalities exhibit signs of duplicity of phase, the predominant maximum at both observatories occurring shortly after the sunspot maximum for inequalities around twenty-four days.

(β) On the other hand, for inequalities around twenty-six days the predominant maximum for both observatories more nearly coincides in time with the subsidiary maximum of the twenty-four day inequalities.

(γ) The short-period inequalities of this paper are as nearly as possible equally developed and equally traceable for temperature and for declination ranges.

(δ) When disturbances are excluded as much as possible, corresponding phases appear to take place at Toronto three or four days before they take place at Prague.

March 4.—The Bakerian Lecture.—"Colour Photometry." By Capt. W. de W. Abney, F.R.S., and Major-Gen. Festing, R.E.

One of the authors of this paper has already communicated to the Physical Society of London (*Phil. Mag.* 1885) a method by which a patch of monochromatic light can be thrown on a screen. This formed the starting-point of the present investigation, which was to ascertain whether it was practicable to compare with each other the intensity of lights of different colours.

The authors describe various plans they adopted to effect this purpose, and finally found that, by placing a rod in front of the patch of monochromatic light, and by casting another shadow by means of a candle alongside the first shadow, the intensities of the two lights which illuminated the two shadows could be compared by what they term an oscillation method. It is known that on each side of the yellow of the spectrum the luminosity more or less rapidly decreases. By placing a candle at such a distance from the screen that the luminosity of the two shadows appears as approximately equal, it is easy to oscillate the card carrying the slit through which the monochromatic rays of the spectrum pass. (The slit is in the focus of the lens which helps to form the spectrum.) The shadow of the rod cast by the candle can thus be made to appear alternately "too light" or "too dark" in comparison with the shadow of the rod cast by the parts of the spectrum falling on the screen. By a moderately rapid oscillation the position of equality of the two shadows can be distinguished with great exactness. The authors describe their method of fixing the position of the rays employed and the source of light with which the spectrum is formed. They also enter into details as to the comparison light, the receiving screen, and the comparative value of the light as seen by them respectively. The curve of the intensity of the spectrum of the light emitted from the positive pole of the arc light as seen by their eyes, which they call the normal curve, is then described. The question as to the effect of an alteration of the colour of the comparison light is then discussed, as is the effect of the brightness of the spectrum.

The next point touched upon is as to the value of mixed light as compared with its components. It is found that the following law holds good, viz.: *that "the sum of the intensities of two or more colours is equal to the intensity of the same rays when mixed."* This law is applied to Hering's theory of colour.

The authors next state that with the majority of people the curve of luminosity of the spectrum is identical with the normal curve, but that in some cases slight differences may be observed, of which one example is given. Such slight deficiency does not